SOFTWARE ARCHITECTURE
SSE4350-1

MINI PROJECT TITLE:

KPP TEST APPLICATION SYSTEM

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1.0 Project Context

KPP Test Application System is a web application platform that helps its users to do some practices so that they are ready to sit for Malaysia's KPP Traffic Rules Test. There are two types of users, which are admin and normal users. The admin can add, update or delete questions inside the application. On the other hand, a normal user just simply can answer the questions contained in the system.

Apart from that, a normal user can get their test result once they have answered all of the questions provided. They can do as many practices as they want. All of the questions are accurate and up-to-date as they are prepared using questions based on Malaysia's Official Handbook and traffic laws. This web application is mainly developed using PHP language along with Bootstrap and CSS. To add-on, it is also well-designed with features that most people are familiar with so that they can understand and use the application efficiently. However, there is a constraint that the user of this application must be connected to the Internet regardless whether it is admin or normal user.

2.0 Architecture Requirements

Architecture requirement section describes the requirements of the KPP Test System Application. It consists of architecture use cases, stakeholder architecture requirements, constraints, and additional non-functional requirements.

2.1 Overview of Key Objectives

There are four quality attributes that have been implemented in KPP Test System Application, which are usability, modifiability, security and availability. The details for these attributes will be discussed in later sections.Architecture Use Cases.

This section will explain about the quality attributes implemented in the KPP Test System Application. The quality attributes are usability, modifiability, security and availability.

2.2 Architecture Use Cases

Use-case diagram describe the high-level functions and scope of a system. The diagrams also identify the interactions between the system and its actors.

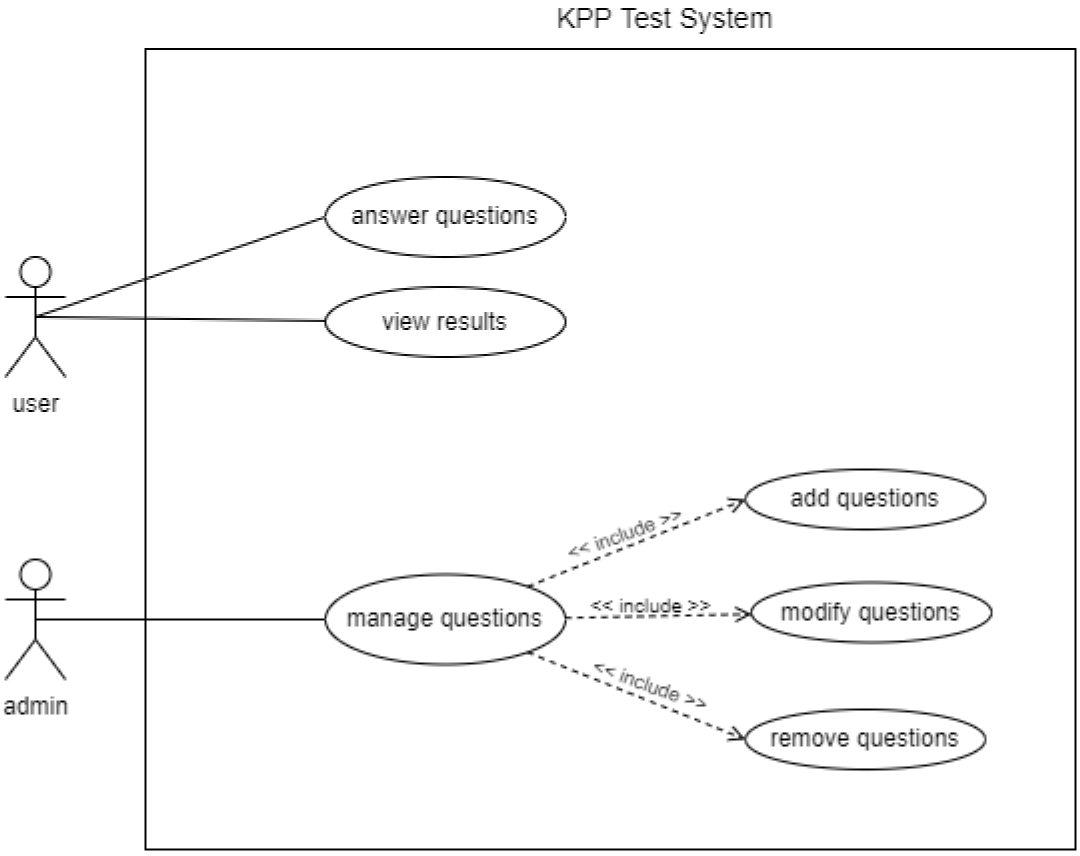
In designing the use case diagram, the highest priority to be considered is the requirements from the stakeholders. Indirectly, the actors of the system are identified.

Firstly, there will be the main user that will use the system most frequently to answer the test using the system. Next, the administrator that will manage the test questions including adding, modifying and removing questions.

To distinguish between normal user and admin, different login interfaces are specified for each type of user. To ensure the data is inaccessible to the public, only existing admin can register new admin and receive the privilege of managing questions.

In order to ensure that the user and administrator is communicating with the system correctly, a broker is programmed to assist the user and admin regarding the status of the action triggered or the system itself. This includes showing success or error messages during logging in, registering, submitting answers and managing questions.

Use case diagram for KPP Test System



2.2.1 Login

Brief Description	The user wants to log in into the web application
Actors	User and admin
Preconditions	The user has registered into the system.
Main Flow	After the user has registered, the user and admin will click the login button to go into the login page. User will insert the required information. If it is correct, the user will be logged in and will be directed to the homepage.
Alternative Flows	1. If an incorrect input is inserted, the user will be redirected to the same login page but there will be an error message at the top of the login form. User needs to re-enter required information and try to login again. 2. The user can logout by clicking the logout button.
Postconditions	Logged in and into the homepage.

2.2.2 Answer questions

Brief Description	A user will answer questions to pass the KPP test.
Actors	User
Preconditions	The customer has signed on to the system.
Main Flow	After the customer has successfully signed on to the system, the user will be redirected to the questions section. The user will need to answer all questions before submitting the answers. After submission, the user can display their results
Alternative Flows	If the user unsuccessfully login, the user cannot answer the questions.
Postconditions	The user can display their results.

2.2.3 View Results

Brief Description	A user will view their results after answering all questions
Actors	User
Preconditions	The customer has submitted all answers.
Main Flow	After the customer has successfully submitted all their answers, the user will view their result on whether they pass the test or not.
Alternative Flows	If the user does not answer all questions, the user cannot display their results.
Postconditions	The user will be logged out.

2.2.4 Manage questions

Brief Description	An admin creating, modifying or removing a question.
Actors	Admin
Preconditions	The admin has signed on to the system.
Main Flow	After the admin has successfully signed on to the system, the admin can create, modify or delete any questions into the database. The questions will be updated into the database and will be added to the question section on the user side.
Alternative Flows	If the admin is not successfully logged in the system, the admin cannot manage the questions.
Postconditions	The record is saved into Katodiet database.

2.2.5 View messages

Brief Description	The broker will display messages to the user.
Actors	Broker
Preconditions	The user or admin triggers any messages from the system.
Main Flow	Registering Admin After the admin inserted all input correctly, a success message will be shown. Otherwise, an error message will be shown. User and admin login If incorrect input is inserted, an error message will be shown. Otherwise, the user or admin will be

	redirected to the homepage. User answering questions If the user has not answered all questions when submitting the answers, an error message will be shown. Manage Questions After creating, updating or removing questions, a success message will be shown. If the action is unsuccessful, an error message will be shown.
Alternative Flows	The system is not used by any user or admin. Hence, no messages will be triggered or shown by the broker.
Postconditions	The messages are shown to the user or admin.

2.3 Stakeholder Architectural Requirements

Stakeholder requirements, also known as user needs or requirements, outline what users do with the system, including the tasks they must be able to do. Therefore, the stakeholder requirements for KPP Test System are as follows:

FR-01 Admin must be able to signup and login to the system.
FR-02 The system must create an account for admin after successfully signing up.
FR-03 Admin must be able to manage the questions.
FR-04 Admin must be able to add a new question into the database system.
FR-05 Admin must be able to edit existing questions.
FR-06 Admin must be able to remove existing questions from the database.
FR-07 Users must be able to login to the system to start the test.
FR-08 The system must be able to display all the questions and answers accordingly.
FR-09 Users must be able to view all the questions and answers.
FR-10 Users must be able to answer all the questions.
FR-11 The system must be able to calculate the correct answer and display the result on the screen
FR-12 Users must be able to view their result after completely answering the questions.
FR-13 The system must be able to store users' results in the database.

2.4 Constraints

A constraint is a limitation on the amount of creative flexibility you have when coming up with a solution. Therefore, the amount of constraints need to be capped because constraints can be the factors that limit the software production. The constraints of our system are:

- The application must be a web application.
- Must be available for Windows.
- The application must be available for 20 hours a day.
- The application must support the English language.

2.5 Non-functional Requirements

2.5.1 Modifiability

Modifiability refers to the ease with which a system may be altered or evolved. Modifiability of the system is required to make any modifications easy to implement. Modifiability will determine how simple it is to add new features to the system. This project implements a layered architectural approach since one of the advantages is evolvability. Hence, each layer is separate and easy to adjust without impacting other levels. The MVC framework will also be implemented to increase modifiability.

2.5.2 Security

Security is responsible for the system's capacity to decrease the chance of malevolent or unintentional activities, as well as the risk of data theft or loss. Nonrepudiation, confidentiality, integrity, assurance, and auditing are all characteristics of security.

- Non-repudiation is the quality that no party to a transaction (access to or change of data or services) may deny it.
- Confidentiality is the property of preventing unauthorized access to data or services.
- Integrity refers to the fact that data or services are supplied exactly as they should be.
- Assurance is the property of the certainty that the participants to a transaction are who they say they are.
- Auditing features is that the system logs actions inside it at sufficient levels to rebuild them.

Examples of security quality attributes in the KPP Test System are:

- Restrictions of user access by authentication/authorization.
- Prevention of SQL injection.
- Encryption of passwords and content.
- Secure connection.

2.5.3 Availability

The term "availability" refers to the likelihood that a user will be able to use the system at any particular time. It also can be described as a percentage of the time the system is available during a given time period. System availability is calculated by dividing uptime by the total sum of uptime and downtime.

High availability of the system is important for the system to operate continuously without failing for a period of time but it is impossible for systems to be available 100 percent of the time.

Example of how to enhance the availability of KPP Test System:

- Provide a backup server.
- Assigning a network monitoring software.
- Implement automated failover.

2.5.4 Usability

Usability refers to the quality of a user's experience when interacting with products or systems, including websites, software, devices, or applications. Usability is about effectiveness, efficiency and the overall satisfaction of the user. It is important to realize that usability is not a single, one-dimensional property of a product, system, or user interface.

Example of implementation to enhance the usability of KPP Test System:

- Intuitive design: KPP Test System internal design is wholly developed using a well-known framework among website developers, which is Bootstrap framework. Bootstrap is a robust front-end framework that has transformed the web development business. Not only that, but Bootstrap speeds up the design process by supplying ready-made design themes and templates that are both flexible and simple to use.. As a result, the time it takes for users to understand the system and complete their task can be shortened.

2.6 Risks

Risks are challenges that can have a negative influence on the system unless handled properly. The possible risk of the system is listed as follows,

2.6.1 Time and Experience Required During Software Design Period

By implementing non-functional requirements such as modifiability, it requires experience with previous designs to know the best solution to minimize size of module, reduce coupling while enhancing cohesion. It requires a concerted effort to design the components so it interacts with high efficiency while requiring low effort and cost to imply any changes in time. And it requires ongoing effort to fight entropy and maintain that modifiability over the complexity of the system.

Therefore, a lot of time will be consumed during the designing process to ensure that the procedure on building the system is clear, correct and efficient. This is since changes of the design of the software in the future period might oppose or diminish the idea of modifiability in the first place.

Hence, a team with great experience and skills or assistance from a senior software architect is needed to ensure that the correct decision is made to ensure modifiability is being implied in the system. In other words, the size and complexity of the source code, external libraries and tools required is minimized through thorough discussion and decision making.

2.6.2 Stolen Identification and Insecure Deserialization

Security implementation can lead to stolen identification and insecure deserialization. In this system, each person needs to use their own identity to access control system function. This is where stolen identification might occur when the unauthorized user tries to register into the system using someone's else identification number. Next, the uses of cookies on the website to keep user login might lead to stolen identification issue. This issue can be solved by deleting normal cookies, but doing so could make some websites more difficult to use. Users might need to submit their information again each time they visit a website without cookies.

The using of password hashing in login system can lead to insecure deserialization. Any code that tries to decode the user's password will fail, since hashing is a one-way activity. Password hashing output cannot be reversed using an efficient algorithm. However, the inability of an efficient technique to convert a hash function's output back to its original input does not imply that it cannot be cracked. Professionals hacker can crack the hash code by getting databases with hashes of widely used words and short phrases.

2.6.3 Data Inconsistency and Poor Data Quality

By having a high availability working system, it can lead to many risks such as data inconsistency and poor data quality. Data inconsistency occurs when the data is not available in the format that the user wants and unable to transform quickly enough to the format needed. Technically, incorrectly formatted data might still be accessible, but unless the system is fast enough to alter it as needed, it might as well not be.

Lack of data quality makes data less usable. The ability to use data effectively is hampered and high availability is compromised when the data sets are rife with inconsistencies, redundancies, errors, or other problems. However, we can control this issue by including data quality tools into the data management processes and use them to clean up data sets. The rest of the data management workflow should include data quality control; it shouldn't be an isolated or infrequent process.

2.6.4 High Ratio of Failure and Errors - human error and execution error

Usability issues are described as potential threats to an ideal user experience, whereas vulnerabilities are defined as user exposure to the risks. As a result, usability issues might be regarded as substantial risk factors for a negative user experience. According to studies, low security usability signifies a severe vulnerability in a system, and vulnerability is a risk attribute.

It is related to user acceptability and addressing the needs of the user. Usability risk is a crucial issue in software product failure since it is not tied to technical product quality but rather a problem that happens during product usage, resulting in unpleasant user experiences. It was found that usability issues have an influence on the usability and overall quality of a software problem. As a result, it is possible to conclude that the usability issue is a substantial risk factor in generating high-quality, usable software.

Usability risks must be effectively controlled in order to decrease software product failure and generate more usable software. However, there is a tremendous deal of misunderstanding about controlling usability risk as compared to managing other risks such as technological risk, market risk, and money risk.

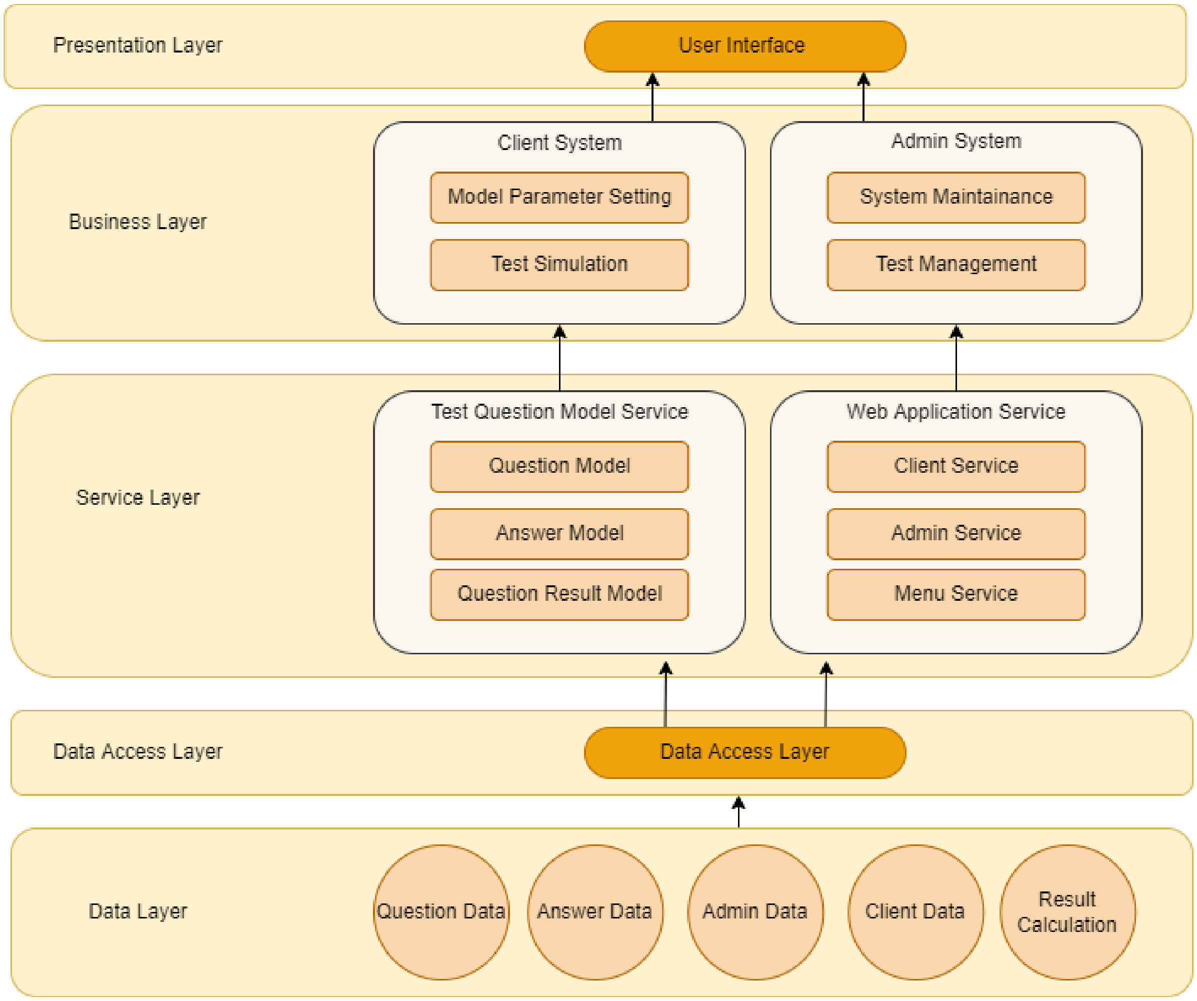
3.0 Solution – Architecture Design

3.1 Relevant Architectural Styles/Patterns

Within a specific context, an architectural pattern is a broad, repeatable solution to a typically occurring problem in software design. Architectural patterns are comparable to software design patterns, however they cover a wider range of applications. Meanwhile, architectural style depicts how the structure of the code or how the system would seem from a 10000-foot helicopter view, illustrating the maximum level of abstraction in the system architecture. Furthermore, architectural styles focus on layers and modules and how they communicate with one another while designing the architectural style of our system.

Below is the architectural styles and patterns that used in KPP Test System:

1. Layered architecture



- **Presentation Layer:** This layer comprises a user interface where users can interact and communicate with the system. It will transfer the data that is inserted by the user to the next layer.

- **Business Layer:** This layer explains all the main functions of the KPP Test System. It has two different categories that do different functions which are client system and admin system. On the client side, KPP Test consists of a test simulation where a list of questions will be displayed on the user interface and the answers will pass to the database layer. Meanwhile, the admin system consists of system maintenance and test management where all the questions will be updated or deleted by the administrator.

- **Service Layer:** This layer can be considered as a user interaction layer. Test Question Model Service consists of a question model, answer model and question answer model to illustrate the real event of the system. In web application service, it consists of all the services that are provided by the system such as admin service, client service and menu service.

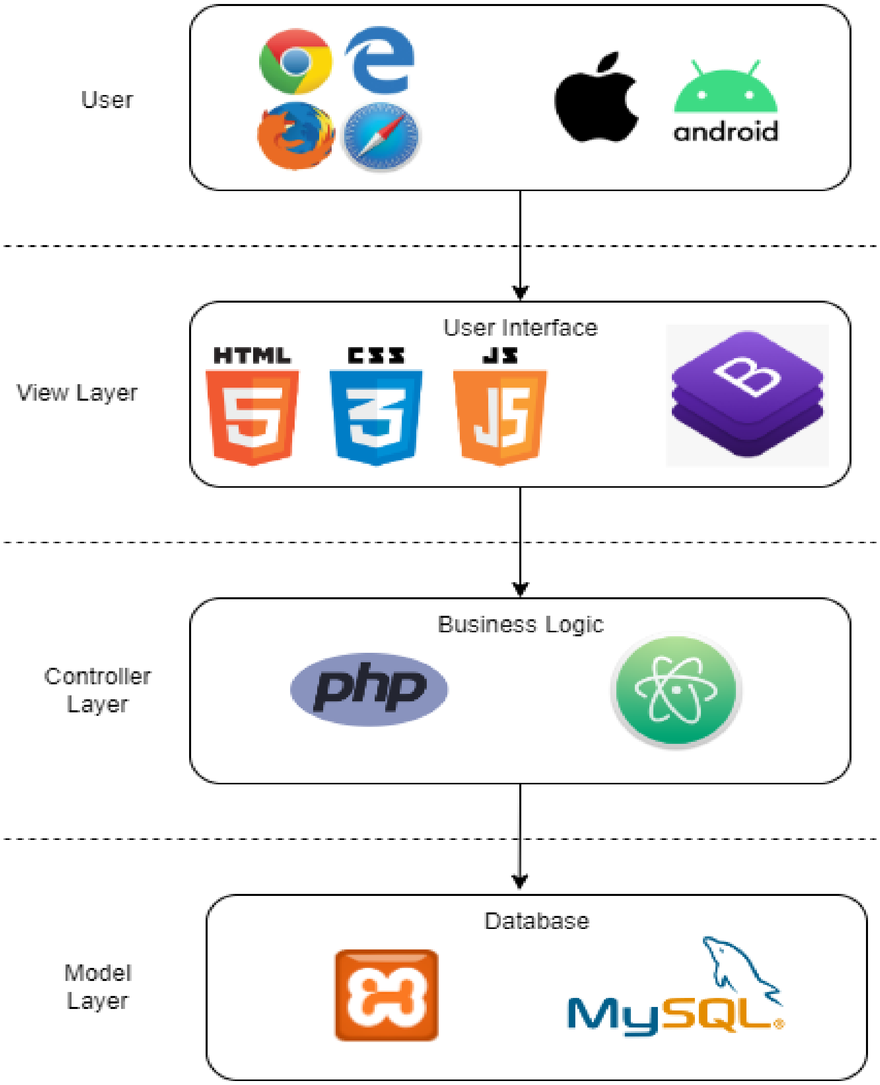
- **Data Access Layer/ Data Layer:** This is the base layer where all records of the application are stored. It consists of records that are important to be stored such as questions and answers data, client data, data of administrator and result calculation data.

3.2 Architecture Overview

This section will explain the overview of the architecture for the KPP Test Application System.

Marketecture

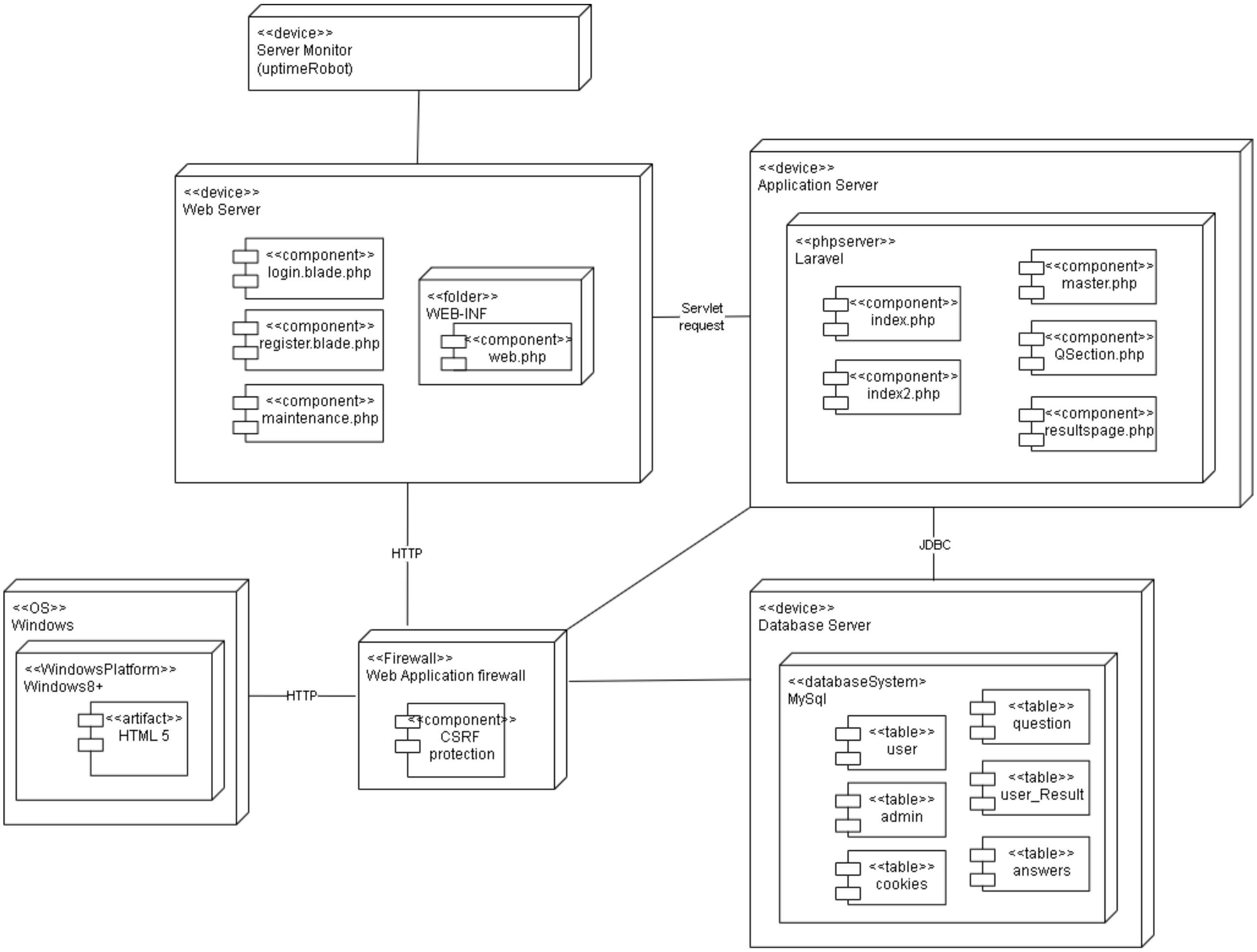
Marketecture is an approach to marketing that seeks to simplify a company's representations of products or services. It shows the major components, their relationships and has a few well chosen labels and text boxes that portray the design philosophies embodied in the architecture. The following diagram is the marketecture for the KPP Test Application System. From the figure below, the users will access the system through browsers or mobile devices browsers and access the view or presentation layer. The controller layer will handle the business logic and interaction made by the users in the presentation layer. The model layer then will provide proper data for the controller to process.



3.3 Structural Views

A view is a representation of a set of architectural elements that can be read and written by system stakeholders. It consists of a representation of relations among the elements. A structure is the set of elements itself, as they exist in software or hardware.

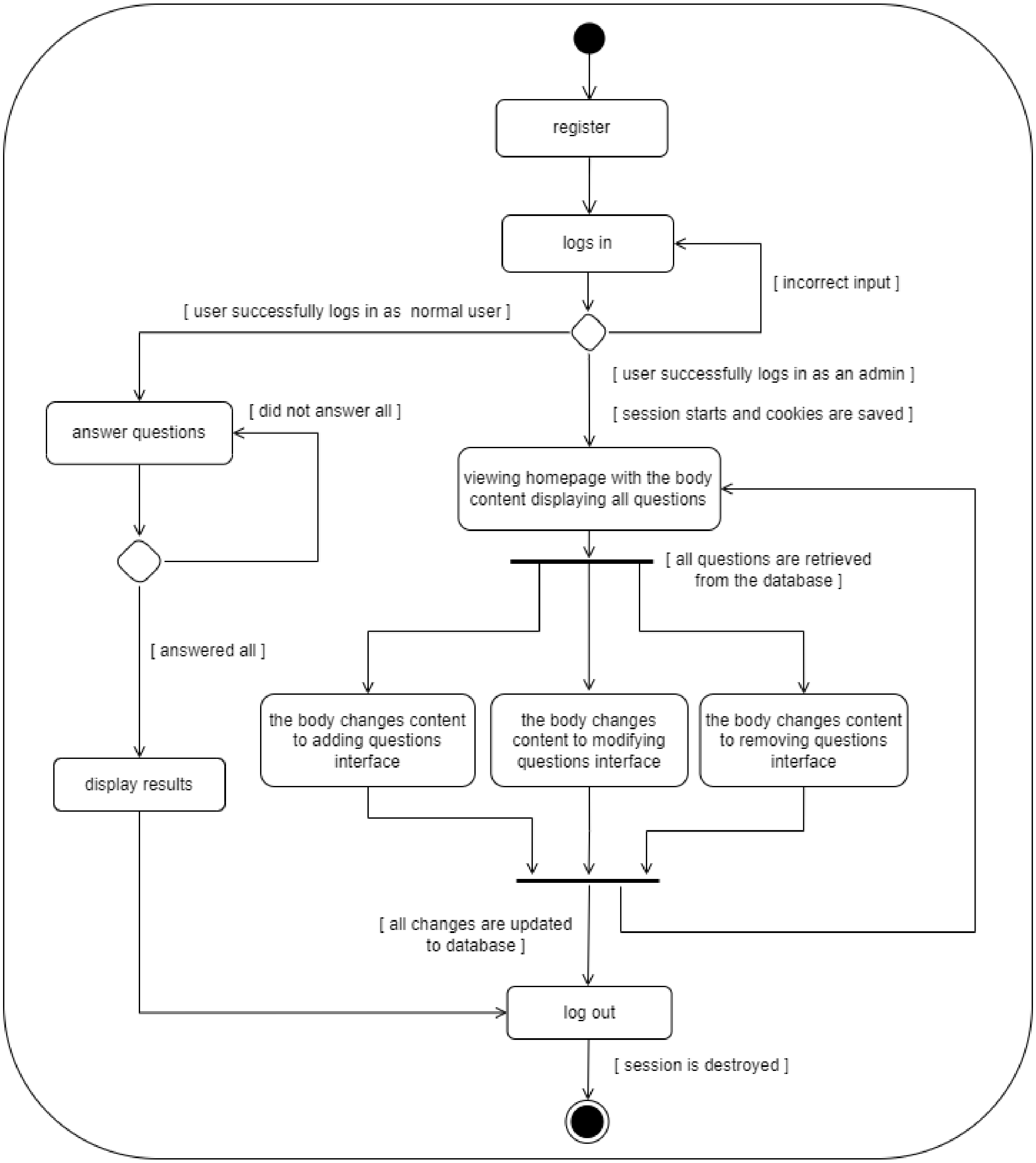
Deployment diagram is used to explain how the software is introduced into a hardware system. It visualizes and describes how the software works with hardware to carry out all functionality and how the software and hardware interact with each other.



3.4 Behavioral Views

Behavioral Views emphasizes the dynamic behavior of the system by showing collaborations among objects and changes to the internal states of objects.

Activity diagram is chosen as the graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. The activity diagram of the system is as shown below,


register
logs in
[incorrect input]
[user successfully logs in as normal user]
[user successfully logs in as an admin]
[session starts and cookies are saved]
answer questions
[did not answer all]
viewing homepage with the body content displaying all questions
[all questions are retrieved from the database]
[answered all]
the body changes content to adding questions interface
the body changes content to modifying questions interface
the body changes content to removing questions interface
display results
[all changes are updated to database]
log out
[session is destroyed]

In the designing process of the activity diagram, many aspects are considered. However, functional and non-functional requirements are prioritized in the decision making. The functional requirements are then designed by implementing architectural styles and patterns to satisfy non-functional requirements.

3.5 Implementation Issues

The technologies that we used are Atom framework, Hypertext Markup Language (HTML) 5, Php Hypertext Preprocessor (PHP), Cascading Style Sheet (CSS) 3, Bootstrap, JavaScript and Xampp MySql database. The Atom framework is used to implement the performance and security quality attributes of the system. HTML 5, and CSS 3, Bootstrap were used to modify the user interface so that the user interfaces are mobile friendly.

3.6 Framework

A software framework called Web Application Framework, sometimes known as "online framework," is created to assist the creation of web applications, including web services, web resources, and web APIs. In a nutshell, frameworks are libraries that make it easier and quicker to create applications.

Here are list of frameworks that can be used to build web applications:

1. Laravel

   In 2011, Taylor Otwell developed the Laravel framework, which, like many other contemporary frameworks, adheres to the MVC architectural pattern. Elegance, simplicity, and readability are ideals held by Laravel. With Laracasts, which has hundreds of lessons, one may immediately begin studying and creating Laravel.

2. Atom

   The ATOM is a Java-based framework with built-in support for service/microservice-based applications, as well as web/mobile apps (REST, SOAP). Additionally, the ATOM offers the possibility to run tests in a cloud-based setting (SauceLabs, BrowserStack). Using a broad range of open source tools and libraries, the ATOM enables behavior-driven development (BDD) and TestNG-based testing.

3. PHPMyAdmin

   On September 9, 1998, the open-source PHP software programme phpMyAdmin was released. In essence, it is a tool used by a third party to manage the database's tables and data. Numerous operations on MariaDB and MySQL are supported by phpMyAdmin. Managing MySQL administration online is phpMyAdmin's primary function. A GUI-based programme called phpMyAdmin is used to administer MySQL databases. Databases and tables may be manually created, and queries can be run against them. It can operate on any server and offers a web-based user interface. We can access it from any computer because it is web-based.

4.0 Architecture Analysis

4.1 Scenario analysis

4.1.1 Modifiability

Source of Stimulus: Developer

Stimulus: Attempts to change User Interface

Environment: Design Time

Artifact: System User Interface

Response: Modification is made with no side effects.

Response measure: In one hour.

4.1.2a Security (Invalid Identification Number)

Source of Stimulus: Client

Stimulus: Attempt to insert unregistered identification number

Environment: Normal operation

Artifact: Data within the database

Response: System displays invalid identification number

Response measure: Error message prompt in 3 seconds

4.1.2b Security (Password Hashing)

Source of Stimulus: Admin

Stimulus: Registered an account

Environment: Normal operation

Artifact: Data within the database

Response: System will keep password in hash format using PHP

Response measure: System updates data maximum within 5 seconds

4.1.3 Availability

Source of Stimulus: UptimeRobot, Assure QuickEDD

Stimulus: Server unresponsive

Environment: Normal operation

Artifact: Process

Response: backup server, restore data, and inform operator continue to operate

Response measure: No downtime after backup server take over

4.1.4 Usability

Source of Stimulus: End-User

Stimulus: Attempt to use all features in the system efficiently.

Environment: Normal operation

Artifact: System

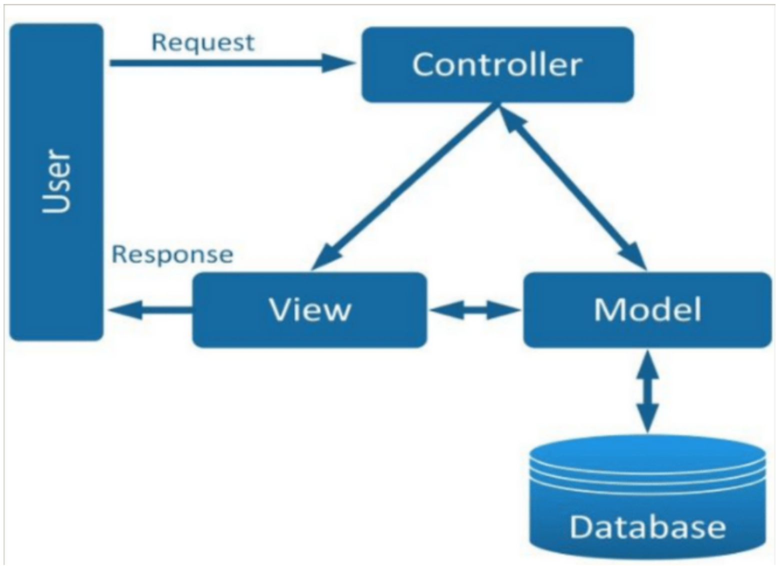
Response: System provides interfaces that are familiar with users and usable in an unfamiliar context.

Response measure: Measure the time taken to complete one’s task.

4.2 Architecture Implementation Tectic

4.2.1 Modifiability

4.2.1.1 Implementing MVC Framework

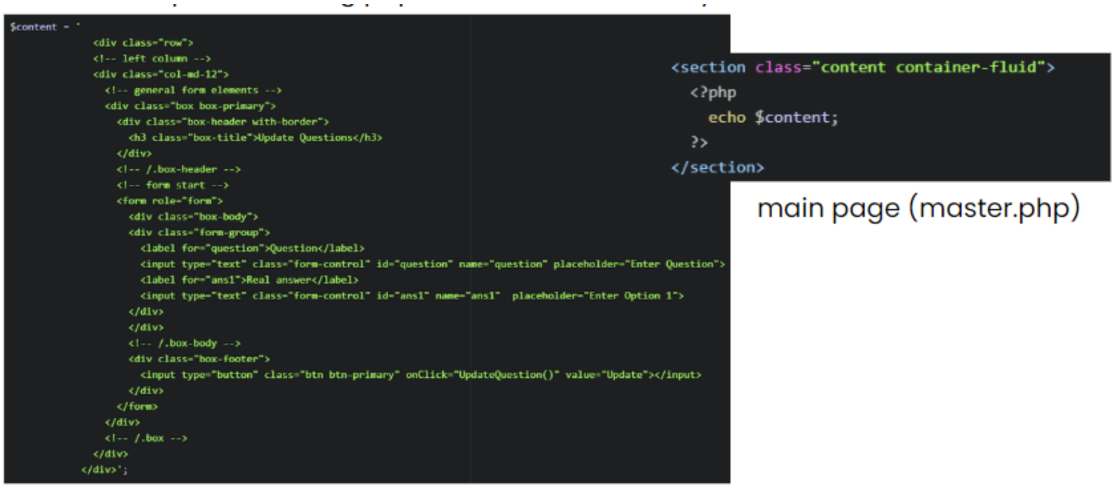


A model, a view, and a controller are the three primary logical components of an application according to the Model-View-Controller (MVC) architectural pattern. These parts are each designed to handle particular aspects of an application's development.A model, a view, and a controller are the three primary logical components of an application according to the Model-View-Controller (MVC) architectural pattern. These parts are each designed to handle particular aspects of an application's development.

- Model: the model component stores data and its related logic. It represents data that is being transferred between controller components or any other related business logic.
- View: the part of the application that represents the presentation of data.
- Controller: the part of the application that handles the user interaction. The controller interprets the mouse and keyboard inputs from the user, informing model and the view to change as appropriate.

Hence, when the developer would like to implement any changes on the user interface, only the view components are affected. Moreover, changes regarding the functionality are easy to modify since the model is separated and can be modified easily.

4.2.1.2 HTML Manipulation using PHP



```
$content = '
            <div class="row">
            <!-- left column -->
            <div class="col-md-12">
              <!-- general form elements -->
              <div class="box box-primary">
                <div class="box-header with-border">
                  <h3 class="box-title">Update Questions</h3>
                </div>
                <!-- /.box-header -->
                <!-- form start -->
                <form role="form">
                  <div class="box-body">
                  <div class="form-group">
                    <label for="question">Question</label>
                    <input type="text" class="form-control" id="question" name="question" placeholder="Enter Question">
                    <label for="ans1">Real answer</label>
                    <input type="text" class="form-control" id="ans1" name="ans1"  placeholder="Enter Option 1">
                  </div>
                  </div>
                  <!-- /.box-body -->
                  <div class="box-footer">
                    <input type="button" class="btn btn-primary" onClick="UpdateQuestion()" value="Update"></input>
                  </div>
                </form>
              </div>
              <!-- /.box -->
            </div>
          </div>';
```

```
<section class="content container-fluid">
  <?php
    echo $content;
  ?>
</section>
```

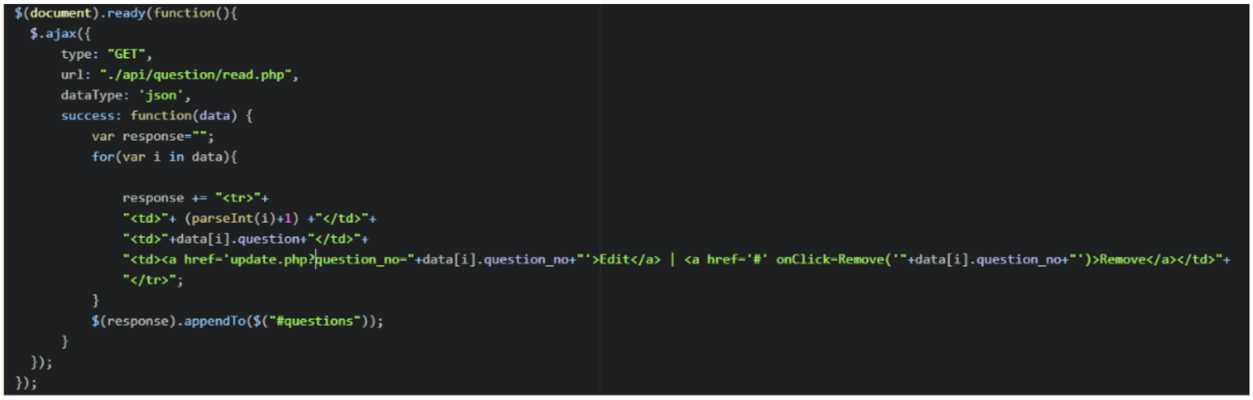
main page (master.php)

other body content (create.php)

Model-View-Controller The PHP framework's architectural design facilitates developer code organization. Additionally, the PHP framework enables them to keep the logic controlling presentation and data manipulation separate, making code update simple.

PHP gives a lot of customization options. With its built-in functions, it is incredibly adaptable and offers a simple connection to a database. It is compatible with many relational database management systems, including MySQL, dBase, IBM DB2, ODBC, PostgreSQL, Inter Base, Front Base, SQLite, and others. It also works with all web browsers, including Apache, Netscape, Microsoft IIS, personal web server, Microsoft IE, and others.It also has a faster loading time over slow internet speed than most of the other programming languages and powerful libraries.

4.2.1.3 Interactive Table Using Datatables



```
$(document).ready(function(){
  $.ajax({
      type: "GET",
      url: "./api/question/read.php",
      dataType: 'json',
      success: function(data) {
          var response="";
          for(var i in data){

              response += "<tr>"+
              "<td>"+ (parseInt(i)+1) +"</td>"+
              "<td>"+data[i].question+"</td>"+
              "<td><a href='update.php?question_no="+data[i].question_no+"'>Edit</a> | <a href='#' onClick=Remove('"+data[i].question_no+"')>Remove</a></td>"+
              "</tr>";
          }
          $(response).appendTo($("#questions"));
      }
  });
});
```

DataTables is a powerful jQuery plugin for creating table listings and adding interactions to them. It provides searching, sorting and pagination without any configuration. DataTables has an extensive API which can be used to access the data contained in a table and otherwise manipulate the table after the table initialisation has completed. The DataTables API is designed to reflect the structure of the data in the table and how to interact with the table through the API. Through this implementation, any changes regarding the questions and records will be updated and viewed from the database dynamically.

4.2.2 Security

A few key technological decisions are applied to ensure that the KPP Test system is well-protected.

Authentication using PHP Function

Verifying a user's identity is the process of authentication. Consider a user who attempts to log in. Their credentials will then be examined and validated against the database. The user will get access to their account if the entered credentials match those that are stored in the database and those credentials are there. However Manually implementing this functionality might be difficult and dangerous. Because of this, PHP has methods that we may utilise to rapidly, safely, and simply create authentication. For requests that come from web browsers, these capabilities offer cookie-based authentication. They offer techniques that let you authenticate a user and check their credentials.

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Encryption using PHP Hashing Function

Storing unprotected login credentials may result in data theft. A database must be encrypted in order to contain sensitive data such as user passwords, session information, and cookie data. In order to securely save user passwords, PHP's hashing functions offer secure hashing, which implies that the password would be saved in an encrypted manner in the database.

4.2.3 Availability

High availability of the KPP Test System can be achieved using some architecture techniques to enable the IT infrastructure to continue to operate even when some component fails. A few techniques that are used are:

Provide a backup server.

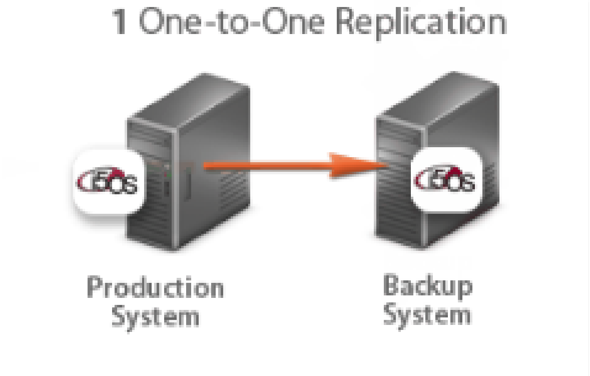
Protection for crucial systems is urgently needed for almost every system. With a copy of data and objects in a server, high availability can utilize the same architectural framework as backup. The frequency of replication varies, and this has an impact on system uptime and the risk of data loss. Real-time server data mirroring is a feature of high availability solutions. In a high availability setup, when a server goes down, the secondary server takes over as the source, and users switch to the replicated server. In this case, recovery time is expressed in seconds. Up until the primary server is brought back up, workloads are still running on the secondary system. The entire procedure can be triggered or automated.

Assigning a network monitoring software.

We are using UptimeRobot as our network monitoring software. A network uptime monitor is made to provide in-depth insight into the network's uptime statistics. Using this information, we can more effectively resolve downtime and boost the performance of the network. Network uptime monitors can assist in promptly addressing typical outage causes and averting future issues. We also can keep track of the uptime data for the network by using UptimeRobot, which can provide alerts, reports, and notifications. This can help us find problems more quickly and solve them.

Implement automated failover.

Assure QuickEDD replicates IBM I data and objects to nearby or distant backup servers in real time. Then, these servers are prepared to take over the production role or restore data, including data from earlier times. Assure QuickEDD provides several replication topologies and can be expanded to many nodes. It is scalable from SMB to enterprise workloads and may be utilized with a variety of IBM I OS versions and storage configurations. With customized switch operations that can execute step-by-step, interactively, or in batch mode, the service uses a graphical interface that supports seven languages and a 5250 interface.

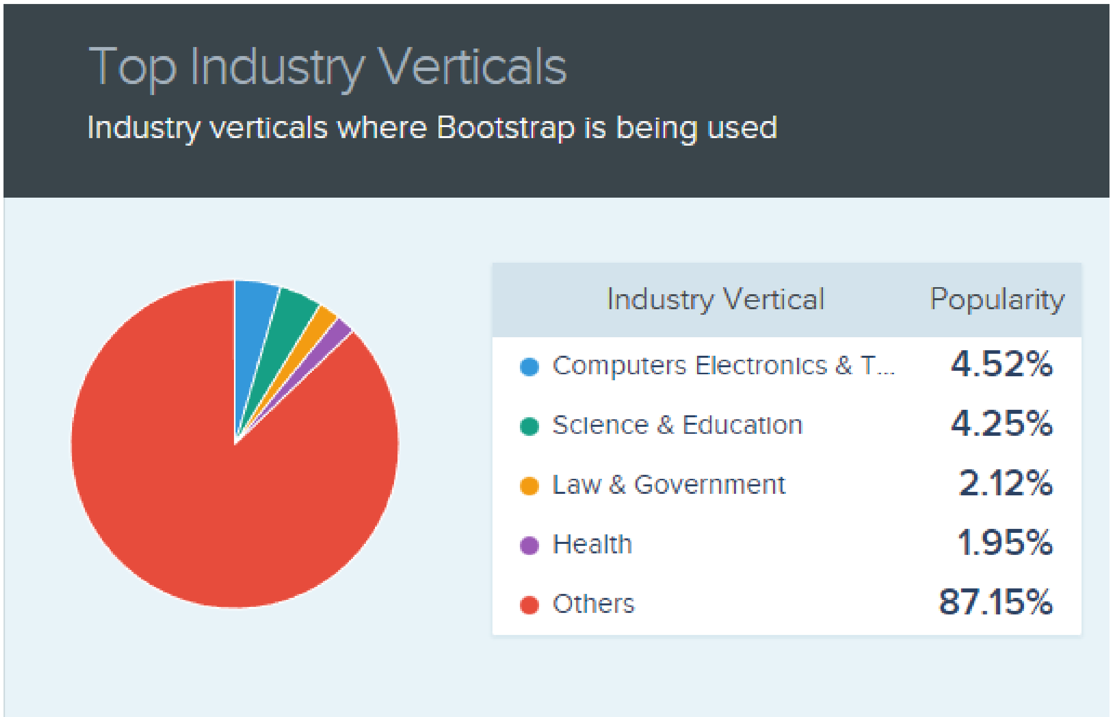


4.2.4 Usability

The framework that is going to be used to cater the usability aspect of the software is Bootstrap.The stimulus for the usability aspect of this project is to let the users use the system's features efficiently. Bootstrap is also a fast framework because it is an agile framework, and it has standard ready-made coding blocks and it works on multiple browsers. By implementing the Bootstrap framework, the user interfaces for multiple channels can be achieved as the web application will work in both desktop or mobile web browsers.

Bootstrap has a great grid system that makes the web application flexible and super responsive by using containers, rows and columns that adapt to the system display. By implementing the grid system in bootstrap, we present the screen of our system at the right ratio based on the user's device. This project is a web application so the programming languages used in this project are Hypertext Markup language 5 (HTML 5), Cascading Style Sheet (CSS 3), Javascript and Php Hypertext Processor (PHP). The HTML will be used to design the structure of the web page. CSS will be used to style the web page to increase usability and give better user experience. For the back-end processing, PHP will be used to handle the business logic.

In addition, Bootstrap ensures the compatibility of the framework with all modern browsers versions and platforms such as Safari, Firefox, Chrome, Edge and Opera. Thus, end-users can use whichever web browser they would prefer to run our system. Although Bootstrap does not support proxy browsers and older browsers, it does not affect its display or functionality.



Top Industry Verticals

Industry verticals where Bootstrap is being used

Industry Vertical	Popularity
● Computers Electronics & T...	4.52%
● Science & Education	4.25%
● Law & Government	2.12%
● Health	1.95%
● Others	87.15%

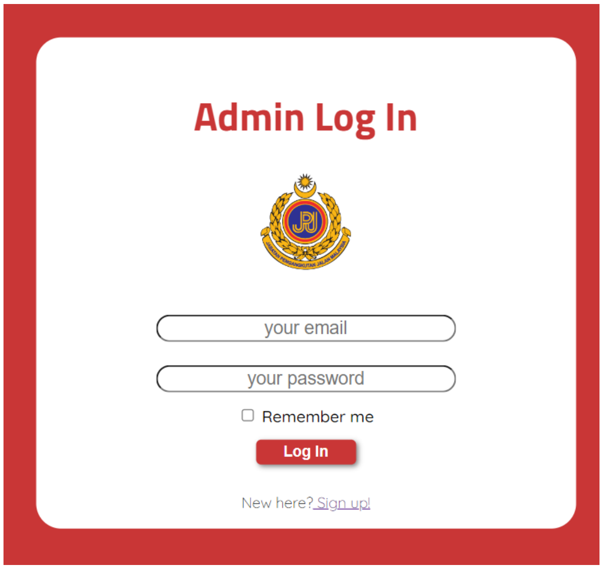
Besides, Bootstrap is popular among web developers. As a result, most end-users do not require to spend a lot of time getting used to using our system. This is due to the high percentage of Bootstrap implementations among live websites all around the world. Most features in our system are similar with other web browsers that end-users regularly use on a daily basis.

5.0 Workable Prototype

For the KPP Test System, there are 2 categories of users which are admin and user. Here are the figures of workable prototypes for the KPP Test System.

a. Admin Login

Admin login will ask the admin user to insert the existing account to enter the system. If the account does not exist, the system will ask the admin user to register into the system.



Admin Log In

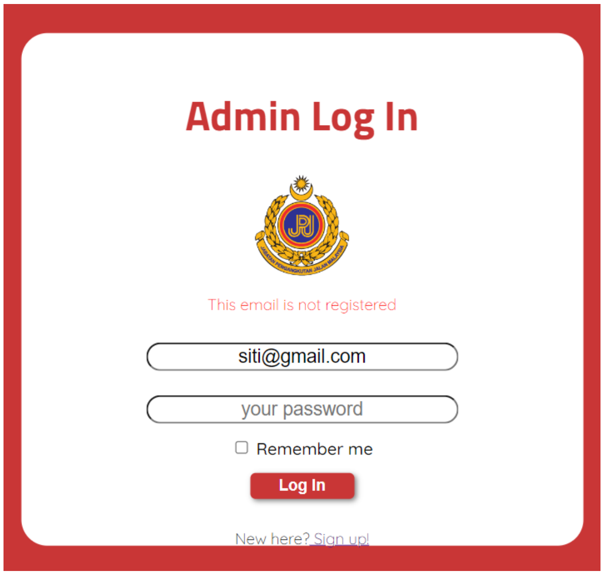
your email

your password

□ Remember me

Log In

New here? Sign up!



Admin Log In

This email is not registered

siti@gmail.com

your password

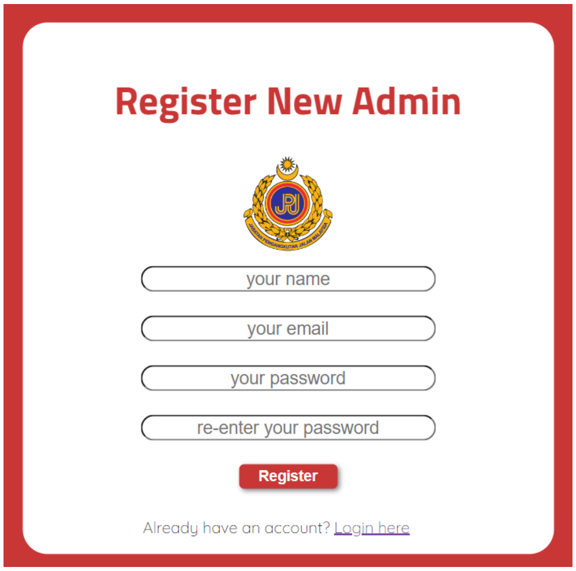
□ Remember me

Log In

New here? Sign up!

b. Register Admin

This interface will ask admin to insert their details such as name, email and password to register into the system. Then, admin will use that details to login into the system.



Register New Admin

your name

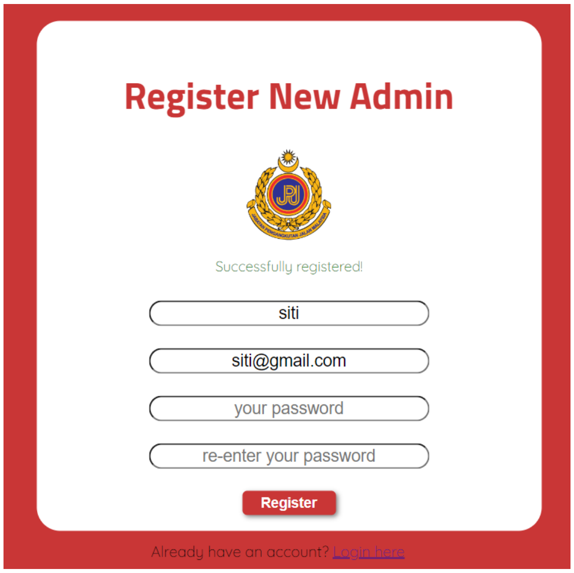
your email

your password

re-enter your password

Register

Already have an account? Login here



Register New Admin

Successfully registered!

siti

siti@gmail.com

your password

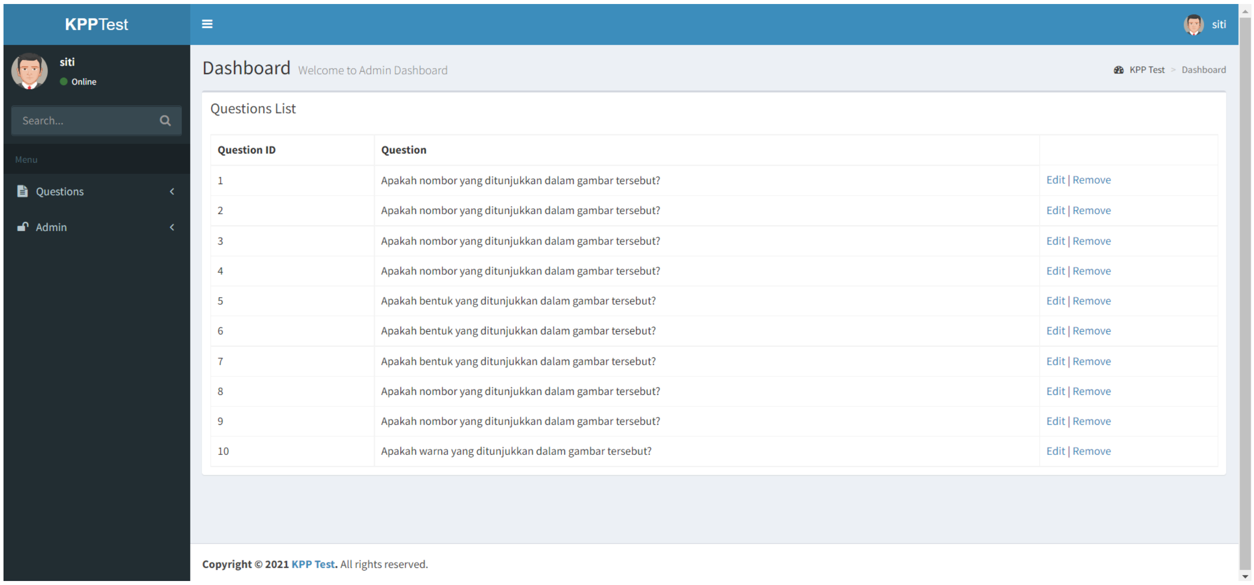
re-enter your password

Register

Already have an account? Login here

c. Admin Homepage

In this homepage, it will automatically display the list of questions that users need to answer in the KPP Test System. At the side navigation bar, it consists of a view results function and add question function.



Dashboard Welcome to Admin Dashboard

Questions List

Question ID	Question	
1	Apakah nombor yang ditunjukkan dalam gambar tersebut?	Edit | Remove
2	Apakah nombor yang ditunjukkan dalam gambar tersebut?	Edit | Remove
3	Apakah nombor yang ditunjukkan dalam gambar tersebut?	Edit | Remove
4	Apakah nombor yang ditunjukkan dalam gambar tersebut?	Edit | Remove
5	Apakah bentuk yang ditunjukkan dalam gambar tersebut?	Edit | Remove
6	Apakah bentuk yang ditunjukkan dalam gambar tersebut?	Edit | Remove
7	Apakah bentuk yang ditunjukkan dalam gambar tersebut?	Edit | Remove
8	Apakah nombor yang ditunjukkan dalam gambar tersebut?	Edit | Remove
9	Apakah nombor yang ditunjukkan dalam gambar tersebut?	Edit | Remove
10	Apakah warna yang ditunjukkan dalam gambar tersebut?	Edit | Remove

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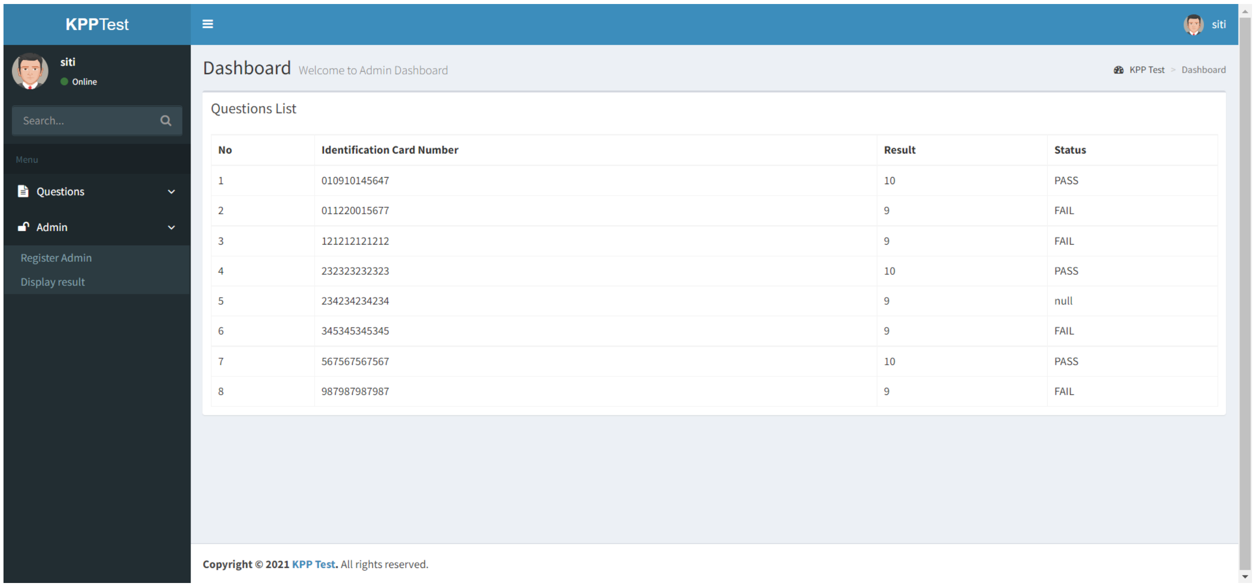
d. Admin View Result

This interface will display the results for each user that answer the questions in KPP Test System.



Dashboard Welcome to Admin Dashboard

Questions List

No	Identification Card Number	Result	Status
1	010910145647	10	PASS
2	011220015677	9	FAIL
3	121212121212	9	FAIL
4	232323232323	10	PASS
5	234234234234	9	null
6	345345345345	9	FAIL
7	567567567567	10	PASS
8	987987987987	9	FAIL

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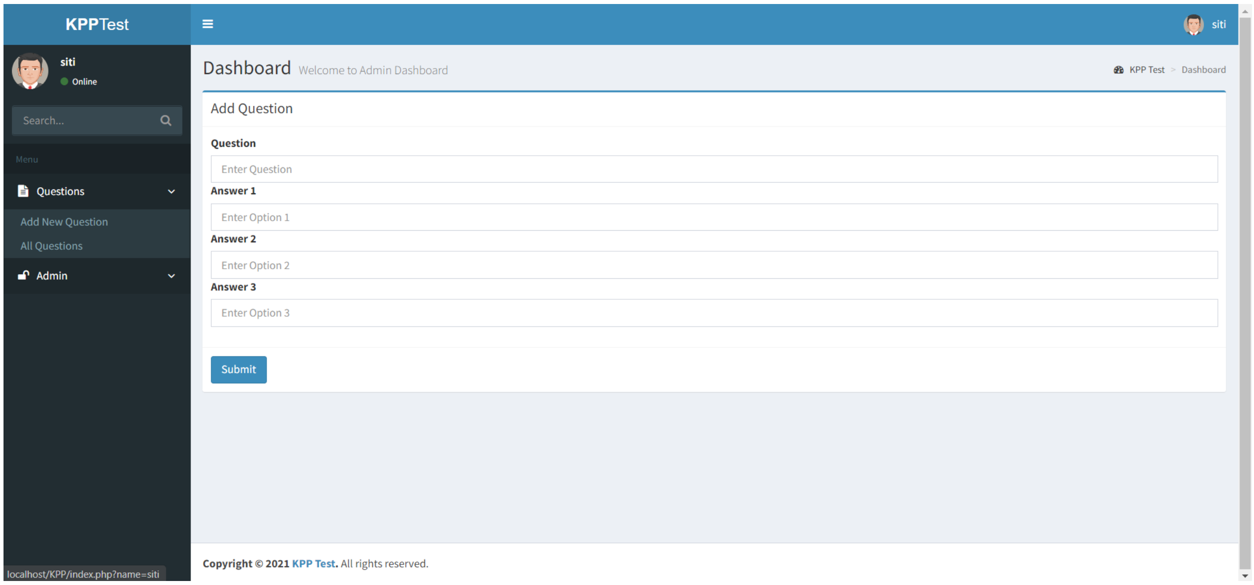
e. Admin Add Question

Here, admin can add new question and it will update in the database



Dashboard Welcome to Admin Dashboard

Add Question

Question: Enter Question

Answer 1: Enter Option 1

Answer 2: Enter Option 2

Answer 3: Enter Option 3

Submit

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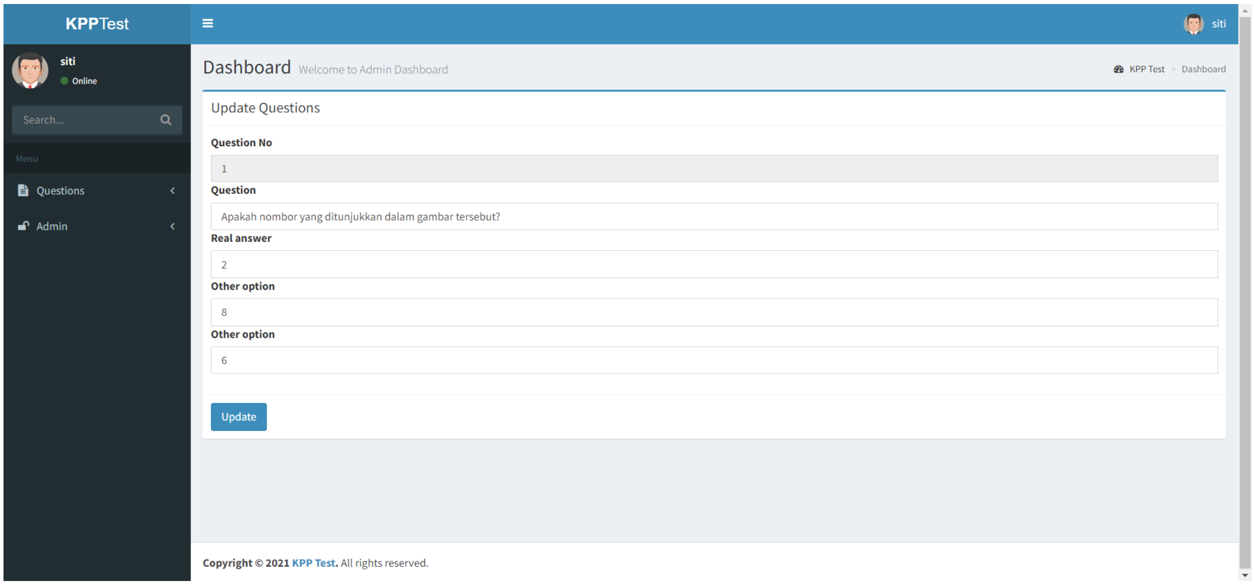
f. Admin Edit Question

Edit question interface will allow admin to edit the question sentence and choices of answers and it will automatically updated in database.



Dashboard Welcome to Admin Dashboard

Update Questions

Question No: 1

Question: Apakah nombor yang ditunjukkan dalam gambar tersebut?

Real answer: 2

Other option: 8

Other option: 6

Update

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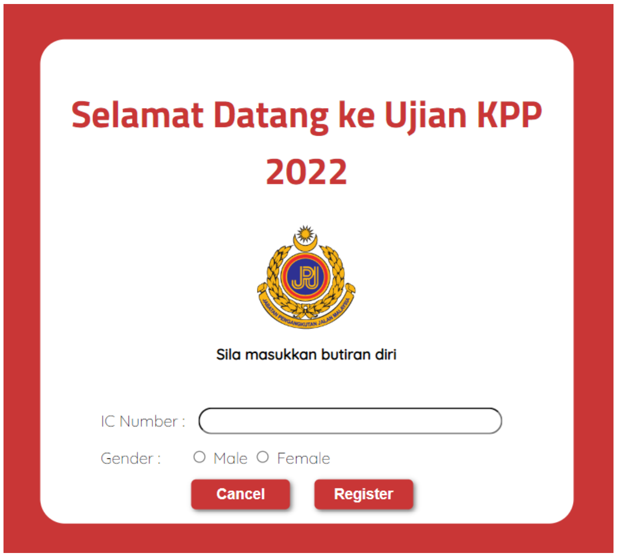
g. User Register

User register will ask the user to insert a valid identification number with gender to enter into the system. If the user insert invalid or unauthorized identification number, the system will display error message and block the user if it exceeds 3 times trials.

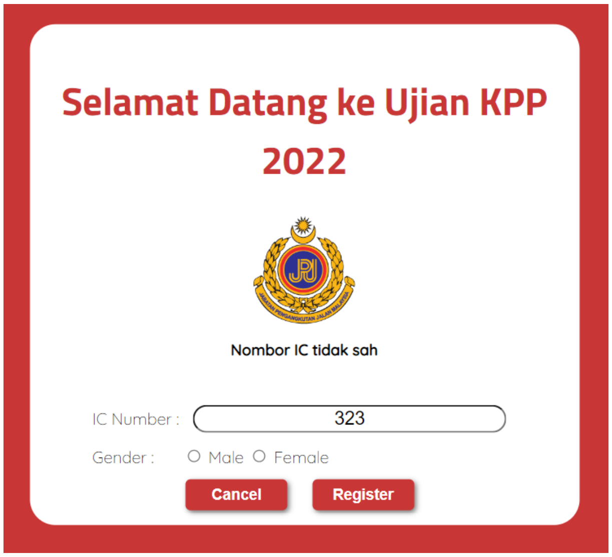


Selamat Datang ke Ujian KPP 2022

Sila masukkan butiran diri

IC Number :

Gender : ○ Male ○ Female



Selamat Datang ke Ujian KPP 2022

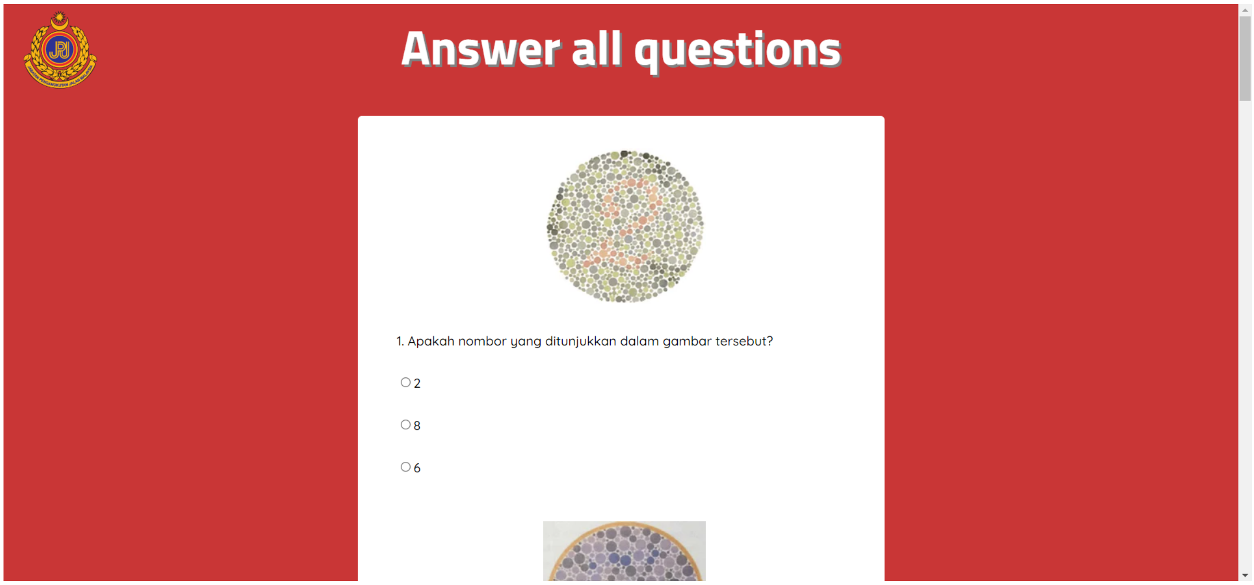
Nombor IC tidak sah

IC Number : 323

Gender : ○ Male ○ Female

h. User List of Questions

This figure shows the list of questions that user need to answer in KPP Test System.



Answer all questions

1. Apakah nombor yang ditunjukkan dalam gambar tersebut?

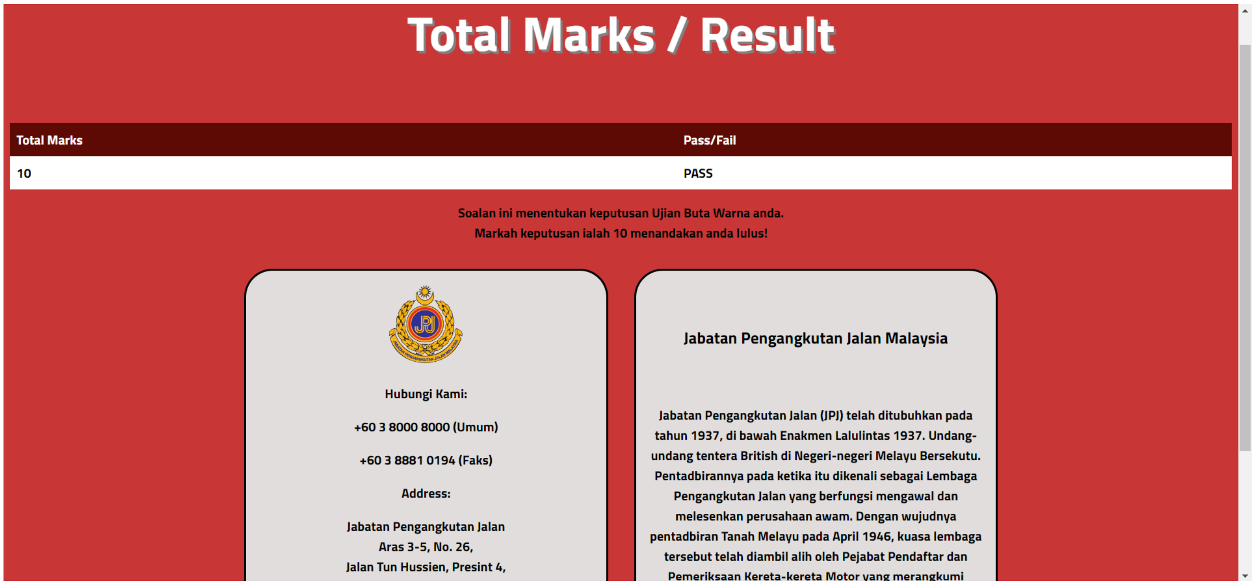
○ 2

○ 8

○ 6

i. User Display Result

After answering all the questions, the system will direct to display result interface to display the total marks that user get.



Total Marks / Result

Total Marks	Pass/Fail
10	PASS

Soalan ini menentukan keputusan Ujian Buta Warna anda.
Markah keputusan ialah 10 menandakan anda lulus!

Hubungi Kami:

+60 3 8000 8000 (Umum)

+60 3 8881 0194 (Faks)

Address:

Jabatan Pengangkutan Jalan
Aras 3-5, No. 26,
Jalan Tun Hussien, Presint 4,

Jabatan Pengangkutan Jalan Malaysia

Jabatan Pengangkutan Jalan (JPJ) telah ditubuhkan pada tahun 1937, di bawah Enakmen Lalulintas 1937. Undang-undang tentera British di Negeri-negeri Melayu Bersekutu. Pentadbirannya pada ketika itu dikenali sebagai Lembaga Pengangkutan Jalan yang berfungsi mengawal dan melesenkan perusahaan awam. Dengan wujudnya pentadbiran Tanah Melayu pada April 1946, kuasa lembaga tersebut telah diambil alih oleh Pejabat Pendaftar dan Pemeriksaan Kereta-kereta Motor yang merangkumi

6.0 Reference

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